“Validation of selected Vṛkṣāyurveda formulation: Kunapajala on Musk Melon”

A THESIS TO BE SUBMITTED TO

THE UNIVERSITY OF TRANS-DISCIPLINARY HEALTH SCIENCES AND TECHNOLOGY

FOR THE AWARD OF THE DEGREE OF

M. SC LIFE SCIENCE (CONSERVATION FUTURE BY RESEARCH)

BY

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UNDER THE GUIDANCE OF

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Private University Established in Karnataka by ACT 35 of 2013

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DECLARATION BY THE CANDIDATE

I declare that this thesis entitled "Validation of selected Vṛkṣāyurveda formulation; Kunapajala on Musk Melon" submitted for the award of Master of Science by Research to The University Of Trans-Disciplinary Health Sciences And Technology, Bengaluru, is my original work, conducted under the supervision of my guide Dr. Abdul Kareem, Associate Professor TDU and co-guide Dr. Kumar. S.K, Medical Director, Ayurveda Hospital - Ayurveda Yoga Naturopathy Wellness Center, The School of Ancient Wisdom. I also wish to inform that no part of the research has been submitted for a degree or examination at any university. References, help and material obtained from other sources have been duly acknowledged.

I hereby confirm the originality of the work and that there is no plagiarism in any part of the dissertation.

Place: Bengaluru **Signature of the Candidate**

Date: 26/07/2024

Name of candidate: Ms. Shalini V

Reg. No.: 2018MSCR05

Month year: July 2024

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CERTIFICATE

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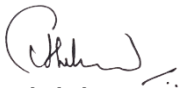
Research Supervisor /s



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DEDICATED TO

This thesis is dedicated to Lord Dhanvantri, the God of Ayurveda and the divine healer, whose blessings and guidance have been a constant source of inspiration throughout this journey.

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ABSTRACT:

The excessive use of chemical fertilizers has adversely affected soil microorganisms and other biotic components, prompting a shift towards organic manures to mitigate toxicity. This abstract explores the revival of traditional Indian agricultural practices, which offer safe and effective alternatives to chemical fertilizers. With a history spanning nearly 4000 years, Indian agriculture encompasses diverse practices tailored to different agro-climatic conditions, soil types, and vegetation.

Traditional agricultural methods include organic compost-based practices, livestock-integrated systems, forest gardening, and agroforestry, among others. These practices not only ensure ecological sustainability but also have economic, cultural, and religious significance. Additionally, ancient Indian texts such as 'Vṛkṣāyurveda' provide insights into plant health and soil management techniques, emphasizing natural plant nutrition and treatments.

One such traditional practice is the use of 'Kunapajala,' an ancient liquid manure known for its efficacy in plant growth promotion. The experiment conducted on musk melon plants validated the effectiveness of Kunapajala, particularly at a 5% concentration with weekly application intervals. Further research is needed for standardization and large-scale production of Kunapajala to make it widely accessible.

In conclusion, traditional agricultural practices, coupled with the revival of ancient plant management techniques like Kunapajala, offer-promising solutions to enhance soil health and agricultural productivity in a sustainable manner.

Chapter 1: Introduction to Vṛkṣāyurveda

The knowledge encompassed in Vṛkṣāyurveda (Picture 1) finds its origins in the Vedas, particularly the Rigveda and Atharvaveda, along with other ancient texts like the '***Brihat-Samhita***' of **Varahamihira, '*Sarangdhara Paddathi*'** by **Sarangdhara, *Charaka Samhita, Susrutha Samhita, Manusmrithi, Arthasasthra, Nithisara, Puranas*** contain extensive information about plant life, with approximately 1,900 synonyms representing about 750 plants are mentioned across various texts. In *Niganthus*, there are approximately 15,000 to 20,000 synonyms representing about 500 -700 plants.

The **Rig Veda** and **Atharva Veda** hymns detail the medicinal properties of numerous herbs and plants, totalling 107 applications in the Rig Veda alone. **Charaka Samhita** emphasizes the importance of plant knowledge for physicians, highlighting the significance of identifying plants and understanding their properties for medicinal use. **Vriksha Chikitsa**, or the treatment of trees, is also discussed in several Samhithas.

Varahamihira's Brihat Samhitha and the **Agni Purana** contain dedicated sections on Vṛkṣāyurveda, while **Kautilya's Arthasastra** in the chapter Shitadhyaksha is specifically talks about agricultural officers' duties.

Attributed to **Salihotra** around 400 B.C., Vṛkṣāyurveda comprises twelve comprehensive chapters covering various aspects of plant science, including soil selection, taxonomy, sowing, germination, crafting, planting, seed collection, manuring, and pest and disease management.

These systematic treatments of plant-related subjects in Vṛkṣāyurveda highlight the rich botanical knowledge and agricultural practices of ancient India, serving as valuable resources for understanding traditional plant science and cultivation techniques.

Chapter 2: Kunapajala reference in ancient text, classical preparation and properties

The documented references to Kunapajala are found in many contemporary documents, viz., Vṛkṣāyurveda written by **Shri Surapala** (Picture 2), who possibly lived around 1000 AD in eastern India, Shri Lokopakara compiled by a poet **Chavundaraya** in1025 AD in Karnataka in southern India, Vishvavallabha by **Chakrapani Misra**, Upavanavinoda, etc.

The text authored by **Shri Surapala** provides detailed instructions on the preparation of Kunapajala, an ancient organic manure. Kunapajala is prepared using ingredients such as bone marrow, flesh from horned animals like sheep or goat, fish, milk, honey, ***Sesamum indicum*** L. (Tila), and ***Vigna mungo*** (Masha). The resulting manure, known as kunapambu or Kunapajala, derives its name from "**Kunapa**" meaning smelling like a dead body or stinking, and "**jala**" signifying water or liquid. This name aptly reflects the process involved, which includes the fermentation of animal remains such as flesh and marrow.

2.1 Classical method for preparation of Kunapajala:

In a classical preparation (Picture 3) the flesh, fat and marrow of Pig, Deer, Fish, Sheep, Goat or horned animals (as per the ancient text) were boiled in water. When properly boiled, the mixture is transferred to an earthen pot. To this mixture milk, powder of Sesame oil cakes, well cooked Masha (Black gram), honey, ghee and hot water are added. There is no mentioned fixity for the quantity of ingredients. The pot is then kept in a warm place for a fortnight and the resultant solution is called Kunapajala (Shrikrishna Jugnu, 2004).

In Vṛkṣāyurveda of Surapala, different varieties of Kunapajala have been mentioned. In the verse 101 of Surapala's Vṛkṣāyurveda it mentions that bone marrow, brain, blood, flesh and excreta, are mixed with water and kept for some duration, which turned into Kunapajala. In the subsequent verses it is quoted that dead Parrot, bones of Horses, horns of Sheep & Goat Fish, Cow dung cake should be boiled in water and later filled along with sufficient quantity husk in a pot smeared with oil. It is also suggested that instead of boiling, it can be roasted in an iron pot and mixed with sesame oil cakes and honey. Black gram and ghee should be added

in the end. All the ingredients mentioned in the preparation does not have specific measure, the prepared compound should be kept in a warm place (Sadhale Nalini, 1996).

2.2 Ayurveda perspectives of properties of ingredients used in the preparation of Kunapajala.

The ingredients used in preparation of Kunapajala are mostly Madura rasa, Guru guna, Madhura vipaka, Brumahan, Balya and Jivaniya which is attributed to Prithvi and Jala mahaboota.

(a) Goat meat (Aja mamsa) poses Madhura Rasa, Laghu snighda guna, Doshaghnata elevates all the tridoshas (vata pita and kapha), karma Brumhan. 'Mamsa is bruhaniyanam' - mamsa is best for growth.

(b) Cow's milk poses Madhura rasa, Guru snigdha guna, sheeta virya, mudhara vipakm doshaghnata it increases kapha and decreses vata, pitta, karma jivaniya, brumhan, balya.

(c) Honey (Madhu) possess madhura Kashaya rasa, guna laghu ruksha, virya sheeta, vipak katu, doshaghanta decrease kapha and increases vata – pitta.

(d) Sesame (tila) possess rasa Kashaya, guna laghu ruksha, virya ushna, vipak katu, doshaghnata decreases kapha pitta and increases vata.

(e) Black gram (masha) possess rasa madhu guna, guru snigha, virya ushna, vipak madhura, doshaghnata increases kapha – pitta and decreases vata, karma brumhan balya.

Kunapajala is prepared through fermentation which can be correlated to Asava and Arishta preparations as mentioned in Ayurveda. The fermentations converts the guru into laghu through gunantaradhan due to vayu and agni mahaboota, due to which the action of vyavyi (spreads quickly) tiksha (penetrating), sukshma (enters into minute pores visited) and ashukari (quick in action). Hence Kunapajala is easily absorbed by the plants. Hence it attribute is as growth promoter and systemic regulator. It may indirectly help in phenomenon of assimilation and acts as a catalyst to active enzymes or precursor's enzyme.

2.3 Properties of Kunapajala:

1. It is a growth regulator used to increase the yield production.
2. It helps in the fast growth of the plant.
3. It provides very essential nutrients like Nitrogen, Phosphorus and Potassium, which helps in regulating root, bud, flower and fruit formation, cell division, chlorophyll production and photosynthesis and also increasing crop resistance to diseases etc.
4. Helps in producing high levels of organic acids like hemic, carbonic and folic acids and increases high cation ion exchange capacity. This capacity is responsible for the mobilization of calcium, potassium and other plant nutrients.
5. The organic compost Kunapajala also provides the other important micronutrients such as Magnesium, Calcium, Zinc, Manganese, Copper, Iron, and Selenium.

2.4 Effects of Kunapajala on plant:

1. Plant Height: application of Kunapajala helps to increase the height of the plant compared other plants without use to Kunapajala.
2. The leaves grows to its maximum length.
3. The number of main branches and the axillary branches per plant increases with the application of Kunapajala. Also it increases the length of the axillary branches to its maximum.
4. The number of buds and flowers increases in number.
5. Roots grow deeper and help in nutrient intake and makes the roots denser and stronger.
6. Besides nutritional value, Kunapajala can also be used to prevent pests / diseases.

Chapter 3: Experiment and Methodology

3.1 Preparation of Kunapajala:

Following are the raw materials used in the preparation of Kunapajala. The ingredients are used as per the text given in Upanavinodha and their measurements are taken as per papers published by Dr. Y L Nene (2006).

1. Goat meat: 1kg (Picture 4)
2. Tila (Sesamum indicum L): 200 grams (Picture 5)
3. Black gram (Masha): 200 grams (Picture 6)
4. Honey: 400 grams (Picture 7)
5. Ghee: 200 grams (Picture 8)
6. Milk: 1 litre (Picture 9)
7. water: 4 litres
8. Dhataki Kusuma dried flower- 20gm (Picture 10)

All the ingredients are measured and kept apart. Firstly, the 1kg of goat meat is chopped into small pieces and cooked with 4 litres of water till it is reduce to ¼th of the liquid content (according to the preparation process of mamasa rasa) (Picture 11). Now add 200 grams of the sesame seeds powder, 200 grams of black gram powder, 200 grams of ghee, one litre of boiled milk and finally add Dhathaki Kusuma for fasting the process of fermentation. After cooling the mixture add 200 grams of honey. Mix the contents well (Picture 12) and transfer the contents into the earthen pot (Picture 13).

Now cover the opening of the earthen pot with khora cloth (cotton cloth) and close the lid (Picture 13), again wrap the lid with the khora cloth. The earthen pot is kept in the dark cool place for 21 days. Since the broth was prepared during summer 21 days was sufficient for fermentation. It may be noted that the fermentation drastically varies both in summer & winter and to be taken care accordingly. On the 22nd day the lid is opened and contents are filtered. The liquid finally extracted is the concentrated Kunapajala (Picture 14) and later it is purified by filtration (Picture 15). Dilute the Kunapajala with water before applying it to plants. Dilution helps ensure that the concentration of nutrients and organic matter in the manure is suitable for plant absorption without causing any harm.

3.2: Physical properties of Kunapajala

Observations	Cooking/ Boiling	Cooling
Colour	Colourless	Greyish white
Surface	Emulsion layer in initial form	The emulsion layer of oils and fats is clearly formed
Texture of meat	Pieces are fully visible	Becomes very soft

3.3 Experiment: application of Kunapajala on Musk Melon

The healthy viable Muskmelon seeds (Picture 16) were procured from the seed bank at GKVK Bangalore.

The experiments were meticulously organized into various sets, each comprising both control and experimental groups. To ensure consistency and reliability, a uniform potting mixture in the ratio of 1:1:1 (sand: Red soil: Manure) was meticulously prepared for all experimental sets. The pots were uniformly filled with this potting mixture and placed under identical climatic conditions.

To eliminate any variables that could skew results, identical support materials of the same length were provided for plant growth across all sets. Furthermore, seeds of the same quality and from the same batch were uniformly utilized. The placement of pots was carefully arranged to ensure equal distribution of sunlight and rainfall to all experimental units.

In addition, uniformity was maintained in watering practices, with the same type and quantity of water administered to all pots. In cases where fungal infections occurred, a consistent fungicide treatment was applied across all experimental groups. These stringent protocols were implemented to minimize discrepancies and ensure the validity of the experimental outcomes.

Experiment No.1:

In the first set of experiment 15 seeds were taken and grouped into 3 sample pots, with the application of Kunapajala with the concentration as given below:

(A) Control group: 3 seeds in 3 separate pots

(B) Experimental group:

(1) 3 seeds in separate pots with 5 % of Kunapajala given with the interval of 4 days.
(2) 3 seeds in separate pots with 5 % of Kunapajala given with the interval of 7 days.
(3) 3 seeds in separate pots with 10 % of Kunapajala given with the interval of 4 days.
(4) 3 seeds in separate pots with 10 % of Kunapajala given with the interval of 7 days.
(5) Three seeds in three pots without Kunapajala.

In the beginning of the experiment the seeds used for the experimental group are soaked and dried (Picture 17) in the above mentioned solution for half day and planted in the pots and water is given equally for all the 15 pots every day. The seedlings started appearing first on 6^{th} day in the 5% solution of 7 days interval, than on 9^{th} day the seedling started in the pot with 5 % solution with 4 days interval and on 10^{th} day only one seedling started growing in the 10% solution with 7 days interval, no seedling appeared in 10% solution with 4 days interval. By this data it is observed that in 10% solution with 4 days interval the concentration of the liquid manure is very potent and the seeds are unable to withstand the concentration, due to which the seedling did not appear.

It is observed that after 2 weeks the seedling in 5 % with 4 days and 10% with 7 days started wilting, there after only in the 5 % concentration with 7 days interval 2 seedling started growing with full length, then after a month the 2 plants of 5% with 7 days interval started producing flowers and fruit, but the fruit was small.

Whereas in controlled experiments (pots without application of Kunapajala), the growth of seedlings appeared at 11^{th} day and slowly the growth retarded, this may be due to drastic change in the climatic condition.

Outcome of experiment1 : With the initial observation it was concluded that the 10% of liquid manure is too strong were seeds are unable to germinate. By this observation the further experiment was fixed with 5% concentration with 7 days interval.

Experiment No.2:

By mid of March the new set of experiments were prepared. Instead of soaking seeds in Kunapajala, they were just dipped in the 5% solution and sowed. It is observed that at 5^{th} day the seedling started to grow in pot with Kunapajala and at 9^{th} day the seedling started to grow in the pot without the Kunapajala. In this experiment the ratio (concentration) is fixed to 5 % solution (liquid manure) with a 7 days interval of 3 saplings in 3 different pots with the same ratio of potting mix and 3 saplings without liquid manure in 3 pots with the same ratio of potting mix. Now the plant has grown up and started flowering (Picture 18) and fruiting (Picture 19 & 20) within a month in the liquid manure.

Data was collected based on the following morphological observation:

1. Germination of seeds.

2. Leaves: To count the number of leaves, to measure the length and breadth of the leaves.

3. Flower: Number of male and female flowers.

4. Fruits: Number of fruits, size and texture of the fruits.

5. Harvesting

3.4 Observation:

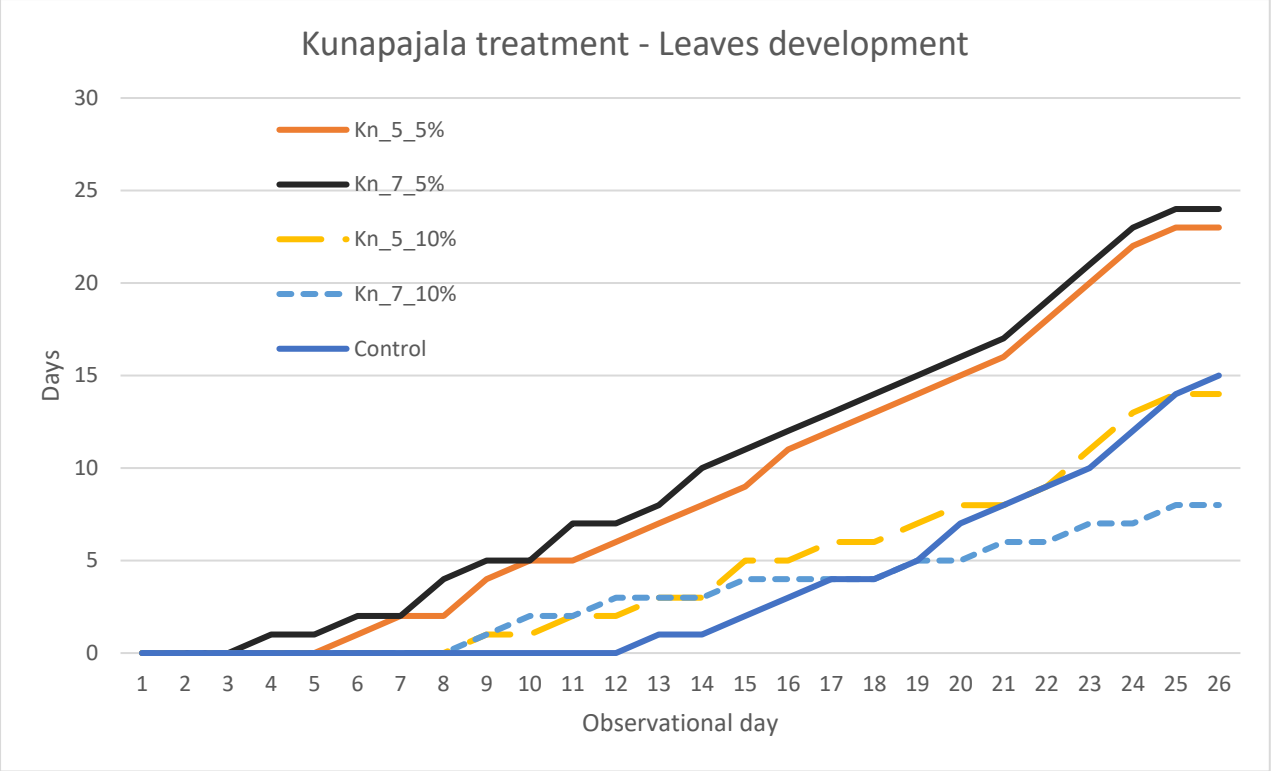
Observation 1: Appearance of Seedling

Concentration of Kunapajala solution	5%	5%	10%	10%	Seeds without liquid manure
Kunapajala solution sprayed with interval of days	5-day	7-day	5-day	7-day	
Observation Day					
1					
2					
3					
4					
5		✓			
6	✓				
7					
8					
9					
10			✓	✓	✓

It is observed that the first seedling was observed in 5% solution within 5 days and in 10% and in control group on 10^{th} day.

Observation 2: number of leaves observed

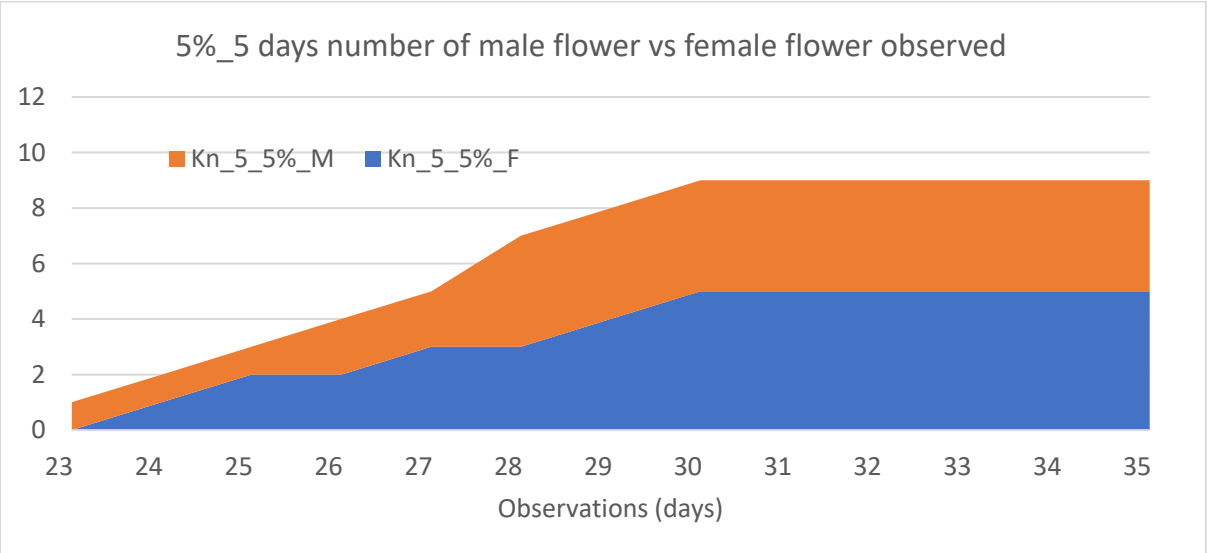
Concentration of Kunapajala solution	5%	5%	10%	10%	Seeds without liquid manure
Kunapajala solution sprayed with interval of days	5 days	7 days	5 days	7 days	Control group
Observation Day	Kn_5_5%	Kn_7_5%	Kn_5_10%	Kn_7_10%	
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	1	0	0	0
9	0	0	0	0	0
10	1	1	0	0	0
11	1	0	0	0	0
12	0	2	0	0	0
13	2	1	1	1	0
14	1	0	0	1	0
15	0	2	1	0	1
16	1	0	0	1	0
17	1	1	1	0	1
18	1	2	0	0	1
19	1	1	2	1	1
20	2	1	0	0	0
21	1	1	1	0	1
22	1	1	0	0	2
23	1	1	1	1	1
24	1	1	1	0	1
25	1	1	0	1	1
26	2	2	1	0	2
27	2	2	2	1	2
28	2	2	2	0	1
29	1	1	1	1	1
30	0	0	0	0	0
Total number of leaves observed at 30th day	23	24	14	8	16



Observation shown that better growth when spraying 5% Kunapajala once every 7 days, followed by 5 days of the same proportion. However, 10% shows a lower growth rate with respective leaf development.

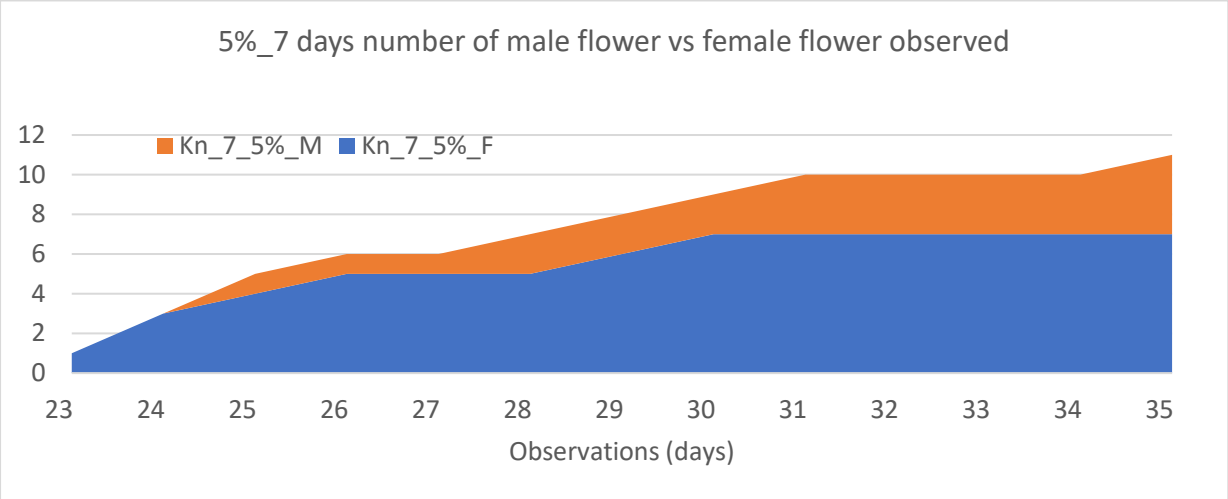
Observation 3: Growth of male flowers vs female flowers @ application of 5% Kunapajala for 5-day interval.

% & Treatment / Observation days	23	24	25	26	27	28	29	30	31	32	33	34	35
Kn_5_5%_F	0	1	2	2	3	3	4	5	5	5	5	5	5
Kn_5_5%_M	1	1	1	2	2	4	4	4	4	4	4	4	4



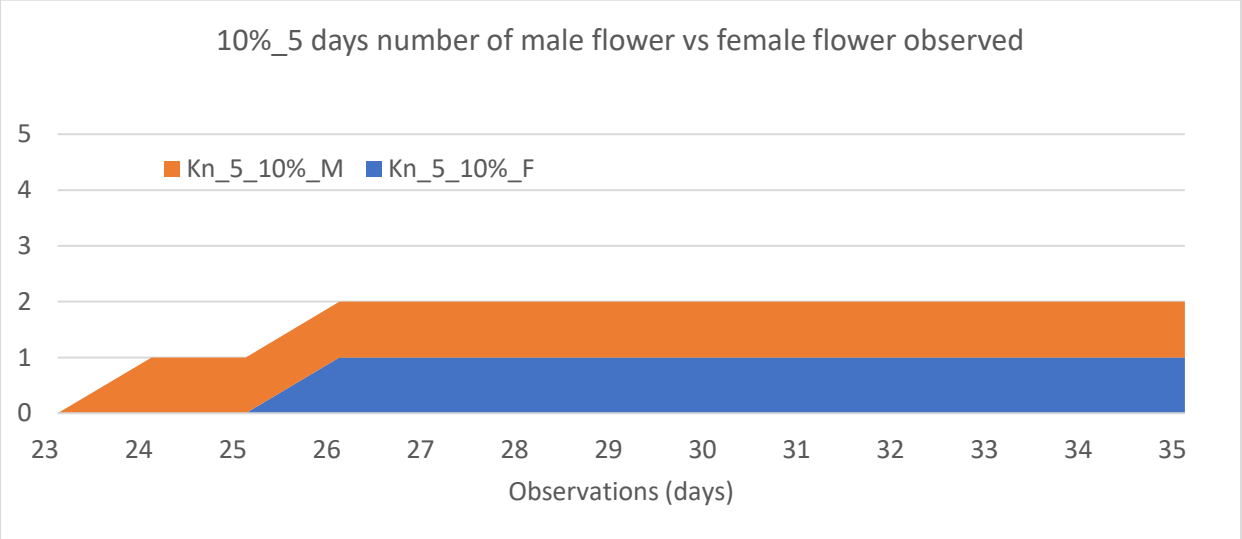
Observation 4: Growth of male flowers vs female flowers @ application of 5% Kunapajala for 7-day interval.

% & Treatment	23	24	25	26	27	28	29	30	31	32	33	34	35
Kn_7_5%_F	1	3	4	5	5	5	6	7	7	7	7	7	7
Kn_7_5%_M	0	0	1	1	1	2	2	2	3	3	3	3	4



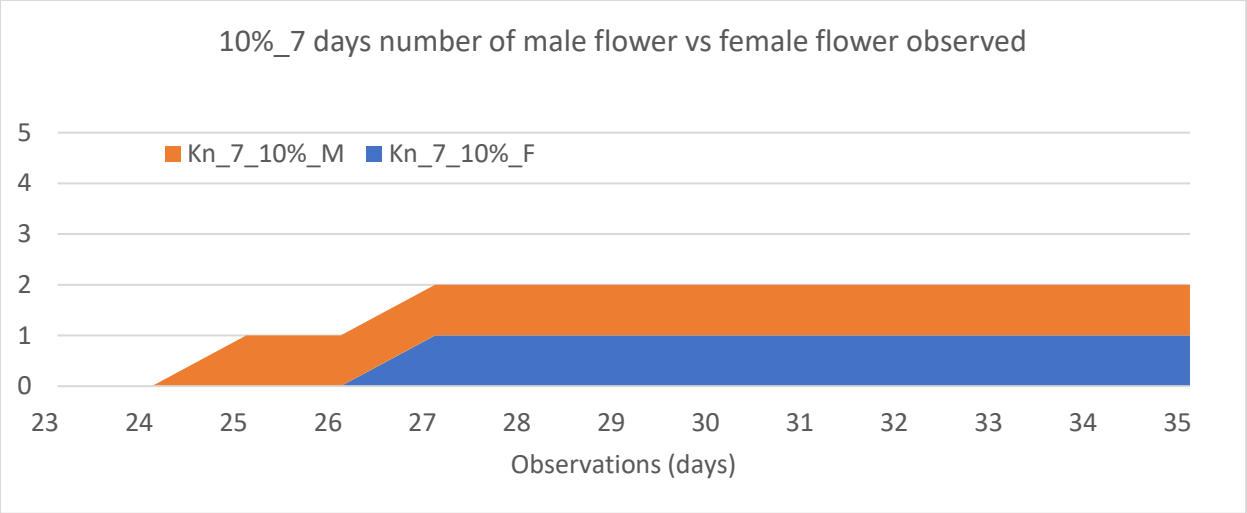
Observation 5: Growth of male flowers vs female flowers @ application of 10% Kunapajala for 5-day interval.

% & Treatment	23	24	25	26	27	28	29	30	31	32	33	34	35
Kn_5_10%_F	0	0	0	1	1	1	1	1	1	1	1	1	1
Kn_5_10%_M	0	1	1	1	1	1	1	1	1	1	1	1	1



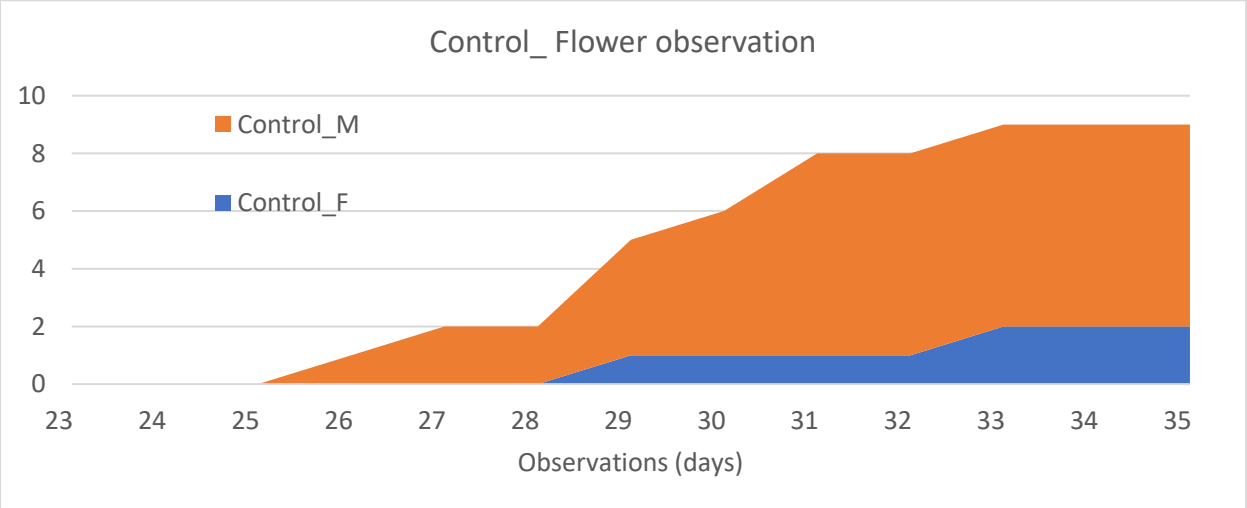
Observation 6: Growth of male flowers vs female flowers @ application of 10% Kunapajala for 7-day interval.

% & Treatment	23	24	25	26	27	28	29	30	31	32	33	34	35
Kn_7_10%_F	0	0	0	0	1	1	1	1	1	1	1	1	1
Kn_7_10%_M	0	0	1	1	1	1	1	1	1	1	1	1	1



Observation 7: Growth of male flowers vs female flowers control group

% & Treatment	23	24	25	26	27	28	29	30	31	32	33	34	35
Control F	0	0	0	0	0	0	1	1	1	1	2	2	2
Control_M	0	0	0	1	2	2	4	5	7	7	7	7	7

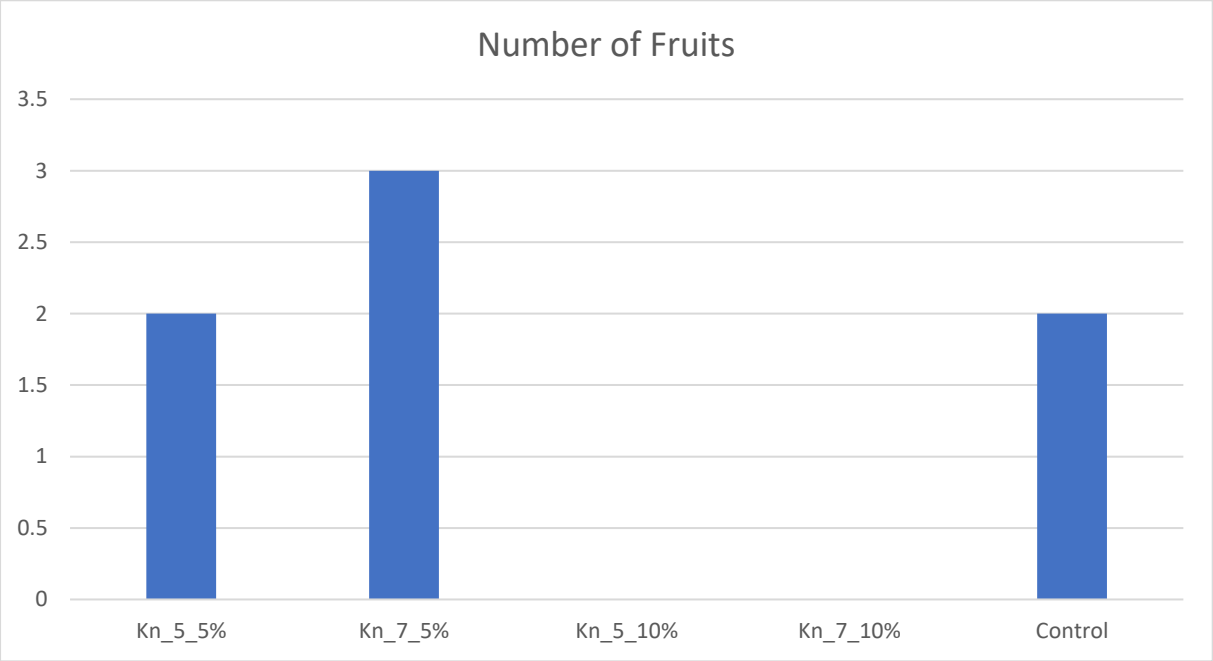


In the above observations 3,4,5,6 and 7 it is observed that production of female flower is more in the experimental group than the control group. It is observed that more female flowers are seen in experimental group where 5% of Kunapajala applied for 7 days of interval.

Observation 8: Number of fruits produced

% / days	41	42	43	44	45	46	47	48	49	50
Kn_5_5%	0	0	1	1	1	2	2	2	2	2
Kn_7_5%	0	1	1	2	2	2	2	3	3	3
Kn_5_10%	0	0	0	0	0	0	0	0	0	0
Kn_7_10%	0	0	0	0	0	0	0	0	0	0
Control	0	0	0	0	0	1	1	1	2	2

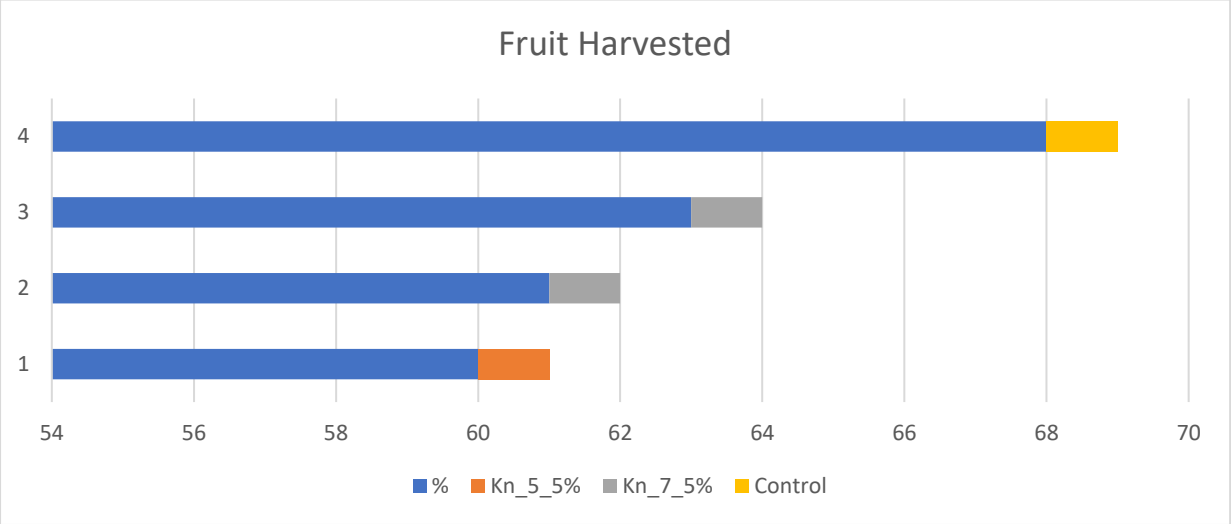
%	No. of Fruits
Kn_5_5%	2
Kn_7_5%	3
Kn_5_10%	0
Kn_7_10%	0
Control	2



It is observed that fruit production was found to be more in experimental group where 5% of Kunapajala applied for 7 days of interval than in the control group. The plants did not survey in the experimental group where the Kunapajala was applied in 10 % of solution.

Observation 9: Number of fruits harvested

% / days	60	61	63	68
Kn_5_5%	1	0	0	0
Kn_7_5%	0	1	1	0
Kn_5_10%	0	0	0	0
Kn_7_10%	0	0	0	0
Control	0	0	0	1



It is observed that fruit got matured early in 5% of Kunapajala applied for 5 days of interval (60 days from sowing). More fruits survived and matured in 5% of Kunapajala applied for 5 days of interval (61 and 63 days from sowing). The fruit got matured 68 days after sowing seed in the control group.

Chapter 4: Inference and Conclusion

From the results obtained in the experiment, it is evident that Kunapajala, when applied at a concentration of 5% and at intervals of 7 days, exhibits significant efficacy in promoting the growth and development of musk melon plants. Additionally, it was observed that the fruits in the experimental group matured 8 days earlier compared to the control group, indicating a noteworthy outcome of the experiment.

The findings of this experiment underscore the potential of Kunapajala as a liquid organic manure in enhancing various aspects of plant growth, such as increasing leaf area and improving flower and fruit yield. These observations align with the principles outlined in the ancient Indian text Vṛkṣāyurveda, which emphasizes the application of natural methods to address contemporary agricultural challenges.

The approximate cost spent on the preparation of the Kunapajala was Rs. 950/- which can have diluted to 5,000 litres of water and used for about an acre of land, which is comparatively less than the harmful inorganic chemicals (Rs.1,500/-). Even the cost of cow dung organic manure is more (Rs. 3,000/- to 4,000/-) than the Kunapajala.

In conclusion, the experiment highlights the potential of low cost Kunapajala as an effective organic agricultural input for promoting plant growth and development. The integration of traditional wisdom from texts like Vṛkṣāyurveda with modern agricultural practices holds promise for sustainable and environmentally friendly approaches to farming. Further research and experimentation can elucidate additional benefits and optimize the application methods of Kunapajala for maximizing agricultural productivity while minimizing environmental impact.

4.1 Scope for future research

Kunapajala, as an ancient indigenous innovation from India, presents a promising avenue for future research in agricultural science. Its traditional organic formulation offers a cost-effective solution with a high level of efficacy, making it a valuable resource for sustainable farming practices. To further harness its potential, several avenues for future research can be explored:

(1) Standardization of Preparation: Establishing high-end research units dedicated to studying and standardizing the preparation of Kunapajala can ensure consistency and quality in its production. This involves identifying optimal ingredients, preparation methods, and storage conditions to maximize its effectiveness and shelf life.

(2) Integration into Academic Programs: Introducing knowledge on traditional organic practices, including Kunapajala, into academic curricula can foster greater understanding and appreciation among students and researchers. This can inspire future generations to explore and innovate within this field, driving further advancements in sustainable agriculture.

(3) Encouraging Research Initiatives: Encouraging young students and researchers to conduct more research on Kunapajala can lead to deeper insights into its mechanisms of action, potential applications, and optimization strategies. This can be facilitated through research grants, academic partnerships, and collaborative projects.
(4) Promotion and Adoption: Government and private sector initiatives to promote the production and usage of Kunapajala on a larger scale can facilitate its adoption among farmers. This includes educational campaigns, training programs, and subsidies to incentivize its use. Additionally, providing access to quality Kunapajala products and technical support can enhance its acceptance and impact in agricultural communities.

By addressing these areas for future research and development, Kunapajala can emerge as a key component of sustainable agriculture, contributing to enhanced productivity, environmental conservation, and socio-economic development in farming communities.

Chapter 5: History of Vṛkṣāyurveda

- Rig Veda (3700 BC) - During the Vedic period greater importance is given to the trees as a source of almost all essential of the life particularly agriculture. It is also described in the 'Rigveda' periods, ***Mthysya Purna***, and also in Mahabharata & Ramayana. Vṛkṣāyurveda is also described in the Ayurveda books like ***Charaka Samita, Sharangadhara Paddati, Raja Nighantu, Dhanvantari Nighantu*** and ***Bhava Prakasha*.** As per Acharya Charaka, a good physician is one who acquainted with plant names external features and uses them properly according to their properties.
- Agnipurana- which is a popular encyclopaedia of all kinds of knowledge and agricultural practices.
- Brihat Samhita (505 – 581 AD) by Varahamihira a book on astrology and astronomy which as separate sections dealing with agricultural practices called Vriksha Ayurveda.
- Kautilya's Artha sastra (296 – 321 BC) there is a separate section describes about Agriculture and agricultural works managing officers, his assistants and also list of functions of the in charge officers**.**
- In 11th century AD Surapala's ***Vṛkṣāyurveda*** and in same era Chavundaraya composed ***Lokopakara*** where some chapters of Vṛkṣāyurveda is described.
- In 12th century AD, Chalukya's king Someshvaradeva complied an encyclopaedia "Abhilashitartha Chitamani or Manasollasa in which a full chapter on Vṛkṣāyurveda was included.
- In 13th century AD Sarangadhara (1283 – 1301 AD) a courtier and scholar in the court of Hamira compiled " Upavanavinoda" which deals with landscape gardening.
- In 1577 AD Chakrapani Mishra, a scholar in the court of great Maharan Pratap compiled text called "Vishvavallabha" "Shivatatvaratnakara" by the king Basavaraja of Keledi, has chapters on Vṛkṣāyurveda (1698 – 1725 AD).
- Some more publications of Vṛkṣāyurveda which currently available are '*Vṛkṣāyurveda* (The science of plant life)' ***Krishi Parashara*, *Kashyapiya Krishi Sukti, krishigeethi*** (Malayalam), ***Lok Swasthya Paramparya Samvardhana Samiti*** (LSPSS) monographs, ***Vṛkṣāyurveda*** (A treatise of Indian Science), etc.

REFERENCES:

1. Jani, S., Prajapati, P.K., Harisha, C.R., & Patel, B.R. (2017). Kunapajala: A liquid organic manure: Preparation and its quality. World Journal of Pharmacy and Pharmaceutical Sciences. Retrieved from https://www.wjpps.com/download/article/1501575995.pdf

2. Shankar, D. (2018). The concept and formulation of Kunapajala: The world's oldest organic manure. Ancient Science of Life. Retrieved from https://www.informaticsjournals.com/index.php/aah/article/view/18292

3. Jani, S., Prajapati, P.K., Harisha, C.R., & Patel, B.R. (2017). Kunapajala: A liquid organic manure: Preparation and its quality. World Journal of Pharmacy and Pharmaceutical Sciences. Retrieved from https://www.wjpps.com/download/article/1501575995.pdf

4. Jani, S. (2017). Kunapajala: A liquid organic manure: Preparation. Retrieved from https://www.researchgate.net/publication/318899649_Kunapajala_a_liquid_organic_m

5. Savitha, D.B., Ashok, B.K., Acharya, R., & Ravishankar, B. (n.d.). Importance of Kunapajala (traditional liquid organic manure). Academia. Retrieved from https://www.academia.edu

6. Agrawal, S. (n.d.). Surapala's Vṛkṣāyurveda. Infinity Foundation. Retrieved from https://www.infinityfoundation.com/mandala/t_es/t_es_agraw_surapala_frameset.htm

7. Hemavathy, J. (1992). Lipid composition of melon. Journal of Food Composition and Analysis, 5(1), 90-95.

8. Hu, M.H., & Ao, Y.S. (2007). Characteristics of some nutritional compositions of melon seeds. International Journal of Food Science and Technology, 42, 1397-1401.

9. Parle, M., & Singh, K. (2011). Musk melon is eat-must melon. International Research Journal of Pharmacy, 2(8), 52-57.

10. Venkateswarlu, K., Devann, N., Priya, R.V., & Kumar, P.B.R. (n.d.). Musk melon: Minerals and nutritional values. Retrieved from https://www.pharmatutor.org/articles/musk-melon-minerals-nutritional-values

11. Ayangarya, V.S. (2006). Mushika Kunapa. Asian Agri-History, 10, 157-159.

12. Surapala. (1996). Vṛkṣāyurveda (N. Sadhale, Trans.). Centre for Indian Knowledge Systems.

13. Sridhar, S. (n.d.). Vṛkṣāyurveda. Centre for Indian Knowledge Systems.

14. Surapala. (1996). Vṛkṣāyurveda: The science of plant life (N. Sadhale, Trans.). Asian Agri-History Foundation.

15. Savitha, D.B., Ashok, B.K., Acharya, R., & Ravishankar, B. (n.d.). Importance of Kunapajala (traditional liquid organic manure) in medicinal plant cultivation. Agriculture and Biology Journal of North America.

16. Nene, Y.L. (2006). Kunapajala: A liquid organic manure of antiquity. Asian Agri-History, 10, 315-321.

17. Mishra, P.K. (2007). Effect of Kunapajala from Vṛkṣāyurveda on growth of paddy. Indian Journal of Traditional Knowledge, 6(2), 307-310.

18. Narayanan, R.S. (2006). Application of Gunapajalam (Kunapajala) as liquid biofertilizer in organic farms. Asian Agri-History, 10, 161-164.

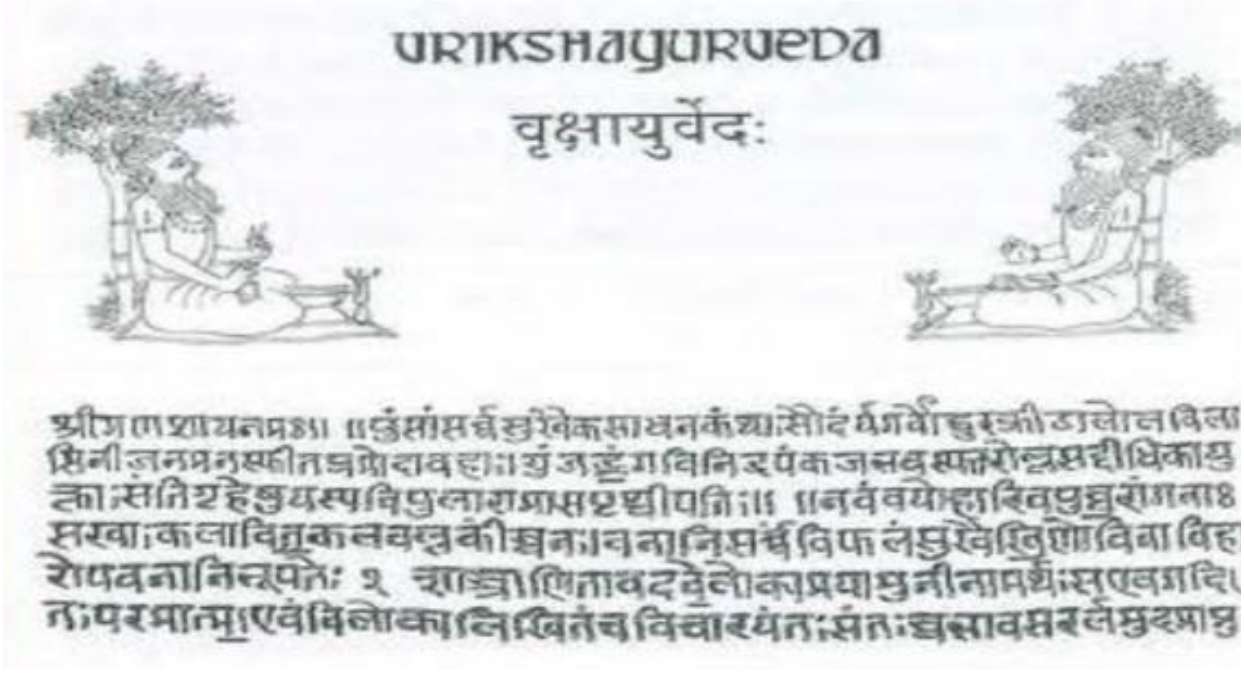
19. Jugnu, S. (2004). Surapala's Vṛkṣāyurveda (1st ed.). Chowkamba Sanskrit Series Office, Varanasi.

20. Sadhale, N. (1996). Surapala's Vṛkṣāyurveda: The science of plant life. Asian Agri-History Foundation.

21. Ayangarya, V.S. (2004). Herbal Kunapa. Asian Agri-History, 8, 315-317.

22. Biswas, S., & Das, R. (n.d.). Kunapajala: A traditional organic formulation for improving agricultural productivity: A review.

Picture 1:



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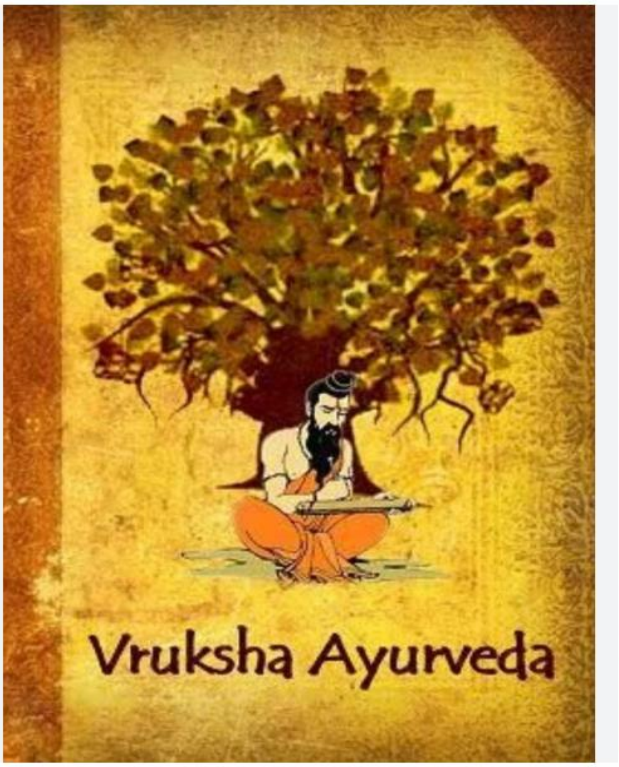
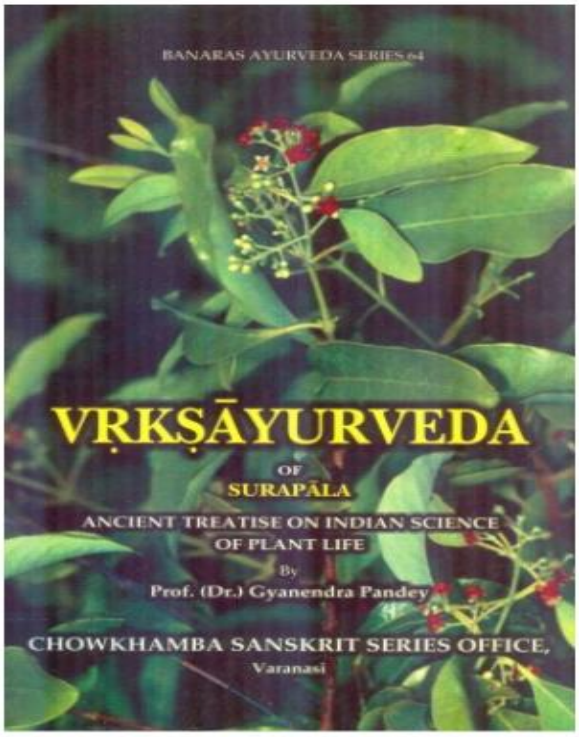




Picture 3: Classical preparation of Kunapajala (Photo source: Vṛkṣāyurveda of Surapala: Ancient Treatise on Indian Science of plant life)

Picture 4: Goat meat (raw material used for preparation of Kunapajala)

Picture 5: Tila (Sesamum indicum L) (raw material used for preparation of Kunapajala)

Picture 6: Black gram (Masha) (raw material used for preparation of Kunapajala)

Picture 7: Honey (raw material used for preparation of Kunapajala) 	Picture 8: Ghee (raw material used for preparation of Kunapajala)
Picture 9: Milk (raw material used for preparation of Kunapajala) 	Picture 10: Dhataki Kusuma dried flower (raw material used for preparation of Kunapajala)

Picture 11: cooking of goat meat with water

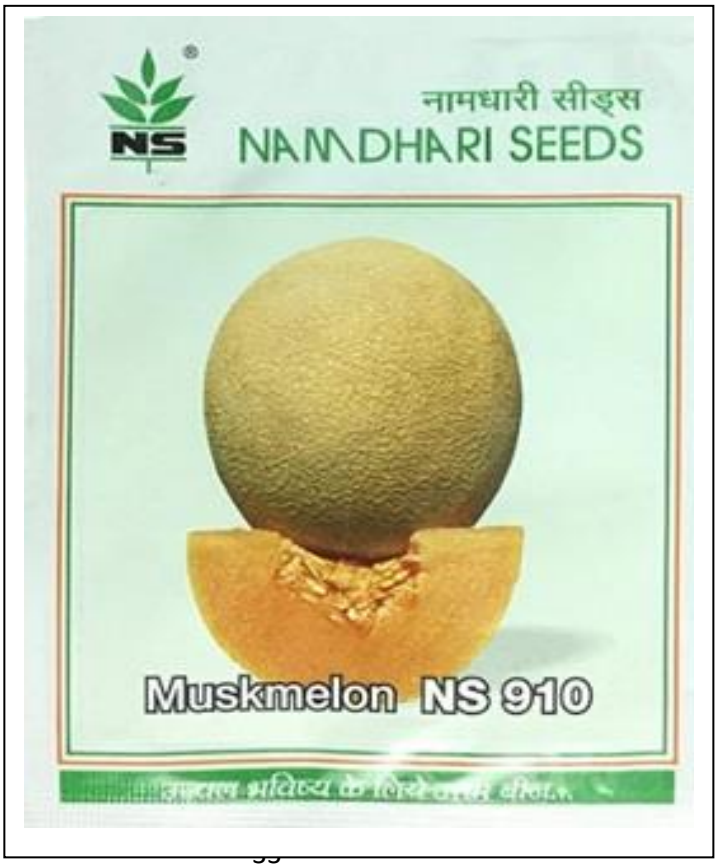
Picture 12: Cooking of goat meat with sesame seeds powder, black gram powder, ghee, one litre of boiled milk and Dhathaki Kusuma. Once cooled honey is added.

Picture 13: Storing of the preparation in the earthen pot and covered with lid

Picture 14: Concentrated Kunapajala obtained after 21 days

Picture 15: Purified Kunapajala and stored in air tight container

Picture 16: Musk melon seeds procured from GKVK Bangalore for the experiment



Picture 17: Seeds were soaked in the Kunapajala solution and dried

Picture 18: Flowering

Picture 19 to 26: Flowering and Fruiting

Picture 19

Picture 20

Picture 21

Picture 22

Picture 23

Picture 24

Picture 25

Picture 26

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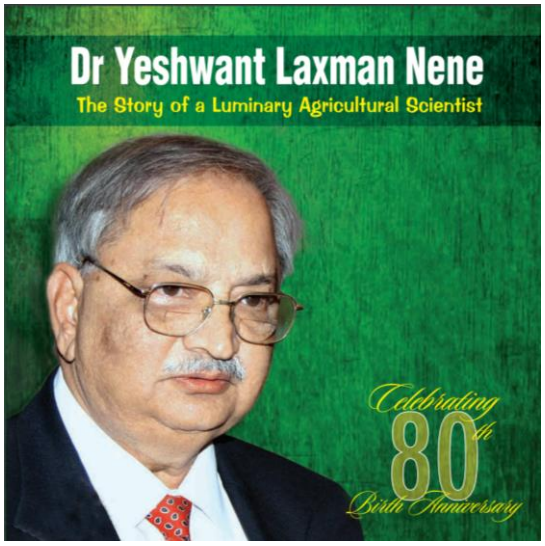
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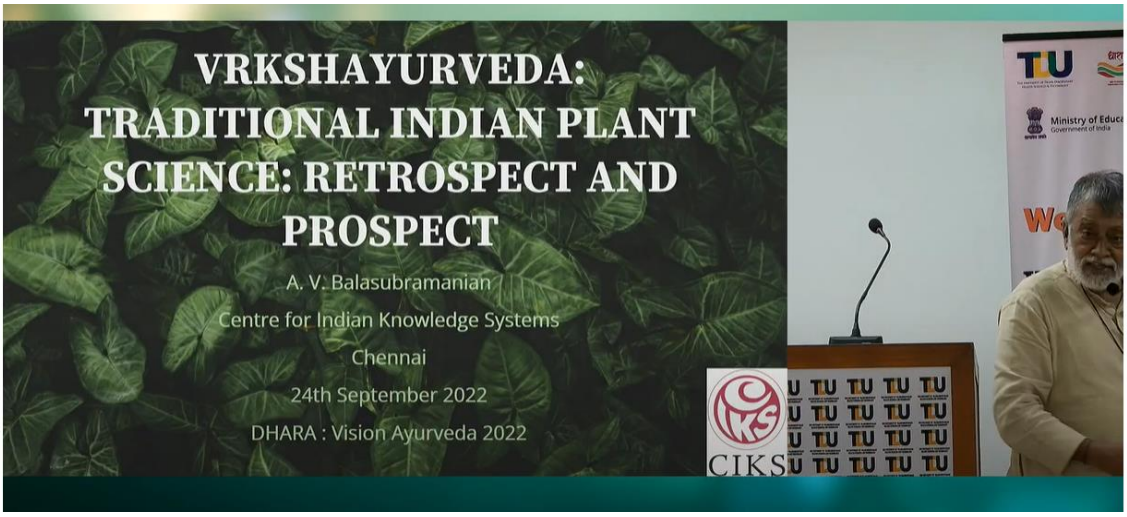
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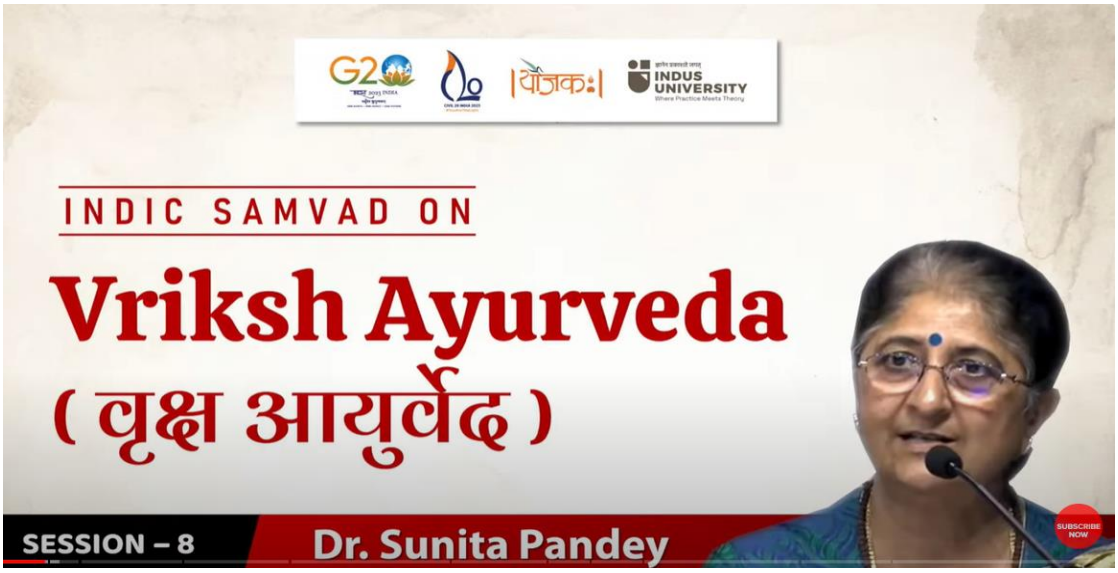
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